



Historic Heating in the Butte Area

Introduction

As most local citizens know, Butte has numerous older homes and businesses. Many of these homes still utilize most or all of their original (usually hot-water) heating systems. With the age of these systems, many homeowners have little knowledge of how these systems work, or how to repair or upgrade them. Butte Citizens for Preservation and Revitalization (CPR) wants to help educate homeowners and provide a reference on hydronic heating systems. The compilation of this information from books, the Internet, and professionals into a useful form will help homeowners better understand their hot-water heating systems and aid them in making informed decisions when it comes to investing money into their system.

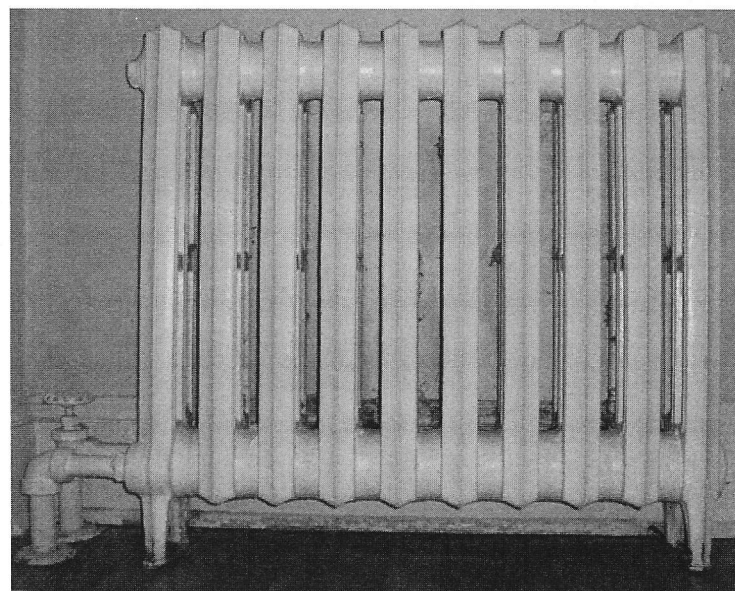
Heating System Types

Hydronic Heating Systems

Two hot-water heating systems currently used in homes today are the gravity-flow and forced hot-water systems. The gravity-flow hot-water heating system, which can still be found in older homes, is rarely installed in homes today. The newest and most efficient system is the forced hot-water heating system. When updating hydronic heating systems, gravity-flow systems are typically removed and replaced with forced hot-water systems. The difference between these two systems is the addition of a pump for moving water around in the forced system.

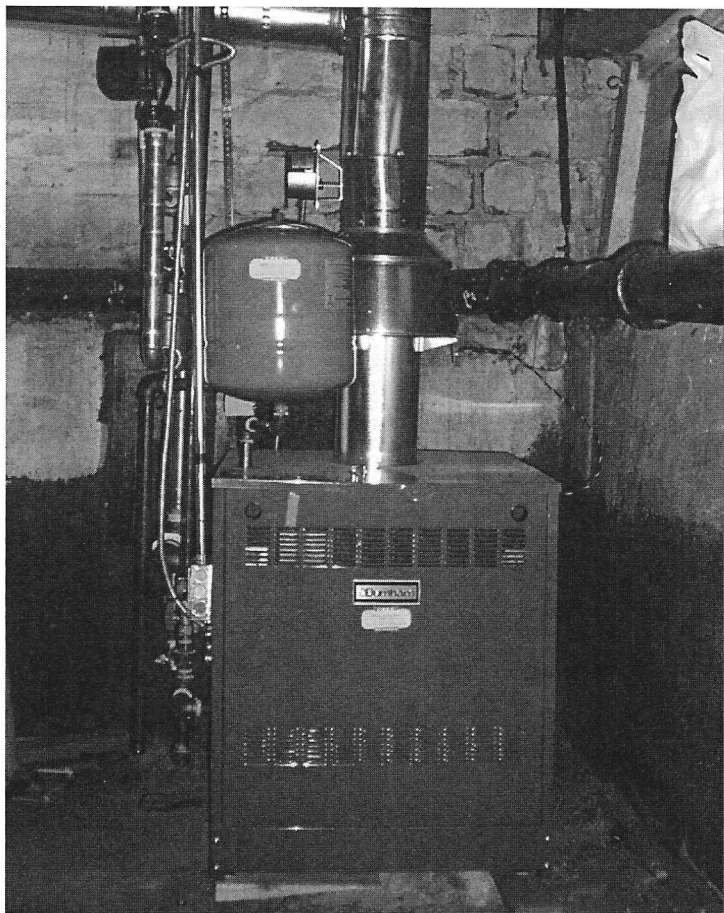
Steam Heating Systems

Steam heating systems are typically used in commercial buildings as an efficient source of heat. Steam systems are generally more expensive to buy, install, and operate than hot-water heating systems. Steam heating systems operate at temperatures above the boiling point of water. As the water boils, the steam rises into the radiators in the building. As the heat is transferred to the radiators, the steam collapses, causing condensation to form. This condensation (water) returns to the boiler to be heated once again. Radiators in a steam heating system act as a gas-to-gas and a liquid-to-gas heat exchanger.



A common cast iron radiator

Maintenance Checks



Forced hot-water boiler

Boiler

Look for a Temperature/Pressure Gauge on the front of your boiler, normally located just above the burners or on the side manifold. For most residential and small commercial systems, this pressure should be 12-15 pounds. Read the gauge when the boiler is cold and the circulating pump is off. If the pressure is too high, the regulator may be set too high or may be leaking. If the feed regulator bypasses even a small amount of water from scale or sediment trapped in the seat, the pressure on the system will creep up to the pressure relief set point and blow off water.

Flow and Return Pipes

Pipes, especially old ones, tend to scale up over time. Calcite, the main cause of scale, occurs naturally as an ingredient of chalk, limestone, and marble. Water passing over and permeating through such rocks dissolves calcite. When this water flows through a water system the calcite precipitates to form a very hard scale on surfaces. When hard water is heated, the problems are exacerbated. Calcite forms ever-growing layers of rock-like deposits until pipes, jets and equipment become totally blocked. Scale wastes both energy and financial resources; just 1/8th of an inch of scale reduces heating efficiency by 25%. Scalewatchers can be purchased over the Internet and can be installed by the typical homeowner.

Expansion Tank

The expansion tank should have sufficient volume to accommodate the expansion of water when heated. If the tank is more than half full, some of the water will have to be drained off. Turn the boiler off and attach a hose to the drain valve of the expansion tank. Close the valve that connects the expansion tank to the boiler and open the drain valve. Drain the tank until empty. Then close the drain valve and open the valve to the boiler system. The expansion tank should be filled to the half-way mark and trap air in the top of the tank. If the tank fills again after a few days, than there is an air leak in the tank.



Example of an older expansion tank

Do It Yourself

Some of the tasks that a homeowner can perform

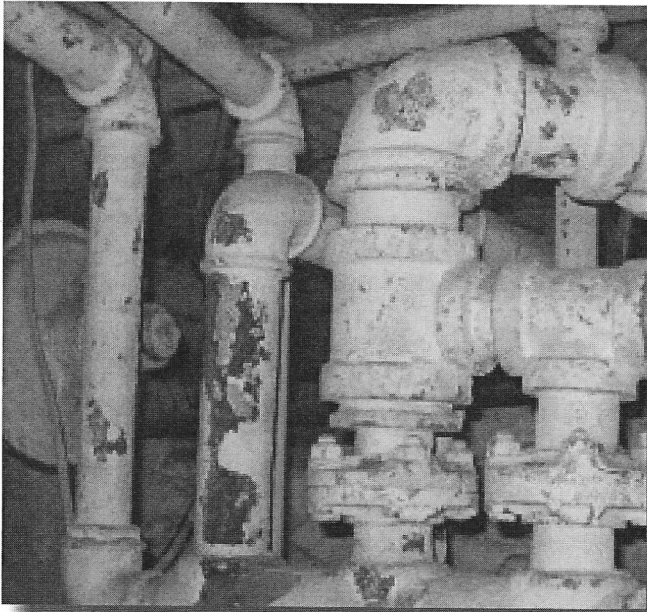
- Bleed air from radiators once a year
- Keeping electrical equipment and air-filters clean
- Keeping floor drains clear
- Providing ventilation and adequate “combustion air” for all fired appliances in the boiler room
- Keeping expansion tank approximately half-full
- Performing annual blow-down of pressure relief valve
- Lubricating pumps, if necessary
- Adding a Scale-Watcher device to the system
- Replacing an expansion tank
- Stripping, painting, and bronzing radiators

In general, when in doubt, call a professional. It may cost a little more now, but it will cost less in the long run and keep you and your family safe.

When to Call Professionals

Some of the areas where trained professionals are needed

- Leaking safety valves and safety relief valves
- Feeding water to boiler
- Dealing with high stack temperatures (excess of 350°F)
- Dripping condensate on the stack or out the front of the boiler
- Resetting of controllers and safety devices
- Removing asbestos
- Replacing boiler
- Performing boiler tune-ups
- Moving, adding, and removing a radiator within a system



An example of old Flow and Return Pipes

Galvanic Corrosion

Another consideration when modifying hot-water heating systems is galvanic corrosion. Galvanic corrosion occurs when two dissimilar metals are placed in contact with each other in the presence of an electrolyte, such as salt water, resulting in the unintentional formation of a galvanic cell and concomitant chemical reaction of the metals involved. This problem may arise for the homeowner when adding or moving radiators. It is possible to reduce and prevent this form of corrosion by one of several ways.

- Electrically insulate the two metals from each other, for example by using plastic or fiber washers to separate steel water pipes from copper-based fittings or by using a coat of grease to separate aluminum and steel parts.
- Keep the metals dry and/or shielded from ionic compounds, (salts, acids and bases) for example by encasing the protected metal in plastic or epoxy.
- Cathodic protection uses one or more sacrificial anodes made of a metal which is more active than the protected metal. Metals commonly used for sacrificial anodes include zinc, magnesium, and aluminum.
- Electrical power supply may be connected to oppose the corrosive galvanic current.

Heating System Components

Further Information

Boiler

A boiler consists of an insulated steel jacket enclosing a lower chamber in which the combustion process takes place, and an upper chamber containing cast-iron sections or steel tubes in which water is heated.

Expansion Tank

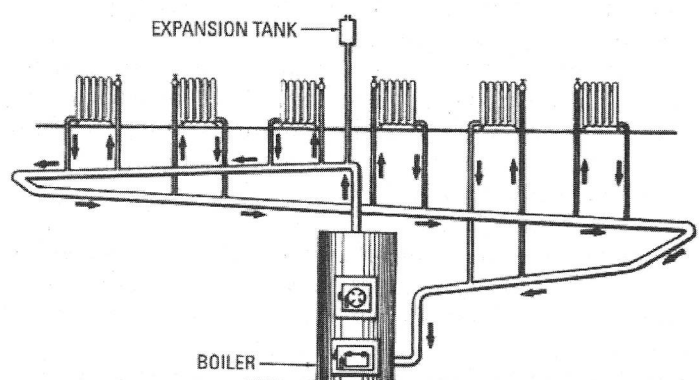
An expansion tank is simply a large tank that fills with water as the temperature of the system rises. As water heats up its volume increases, an expansion tank accommodates this increase in the volume of the water. Expansion tanks are typically found in the attic for gravity-flow systems and on the boiler for forced-flow systems.

Supply and Return Pipes

Supply and return pipes are an integral part of the heating system. Supply pipes deliver water to the radiators after it has been heated in the boiler, while return pipes take the water back to the boiler after the heat has been exchanged in the radiator.

Radiator

A radiator is a liquid-to-air heat exchanger that is used to heat a room. Radiators come in many sizes and designs. There are three types of common radiators: cast iron, convector, and baseboard. Cast iron radiators are extremely durable and are very common in older homes and buildings in the Butte area.



Gravity-flow diagram

Local sources of information:

Plumbers and plumbing supply stores in the Butte area have a wide variety of tools, materials and information to assist you on the repair and maintenance of hot-water heating systems.

Seeking advice from individuals in your area involved in historic preservation, such as Butte CPR, can provide you with hands-on, practical information.

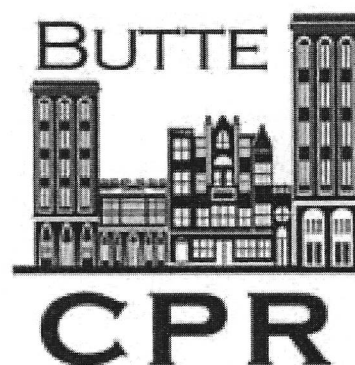
Other Sources of information:

Publications and other printed information on heating systems are widely available. The Internet is a great source for historic preservation and rehabilitation information. Visiting Google.com and searching for "hot water heating systems" is recommended as a first step in locating information about hydronic heating systems. Two other good sources of information include the following.

An overview of hot water systems, along with other resources:

<http://www.oldhouseweb.com>

U.S. General Services Administration has published a step-by-step guide to refinishing radiators, available at: <http://w3.gsa.gov/web/p/hptp.nsf/0/2ab4bc820b44e81e852565c50054b614?OpenDocument>



P.O. Box 164
Butte, MT 59703
www.buttecpr.org

Page design by Montana Tech Students: Jackie Dumke, Stephen Donaldson, Kotie Hafer. Text edited by: Vanessa Murray, Jenelle Stokken, Laci Dunfee